CLAIMS

WHAT IS CLAIMED IS:

1. A vehicle or test stand mounted tire and wheel rim monitoring apparatus comprising:

a radar transceiver for transmitting RF signals to a rotating tire or wheel rim and for receiving RF echoes from the rotating tire or wheel rim to produce a radar output;

a processor for processing the radar output to provide an indication of a tire parameter or wheel speed.

2. The apparatus of claim 1 wherein the radar transceiver is a Doppler radar.

3. The apparatus of claim 2 wherein the Doppler radar is a pulse Doppler radar.

4. The apparatus of claim 2 wherein the Doppler radar is a quadrature radar.

5. The apparatus of claim 1 wherein the processor further comprises an alarm or display.

6. The apparatus of claim 1 wherein the processor output is a control signal which controls a system of a vehicle.

7. The apparatus of claim 1 wherein the radar transceiver is positioned so that the processor provides an indication of tire tread delamination or tire out-of-round or tire run-out conditions.

8. The apparatus of claim 1 wherein the radar transceiver is positioned so that the processor provides an indication of tire sidewall ballooning or tire wobble.

9. The apparatus of claim 1 wherein the radar transceiver is positioned so that the processor provides an indication of wheel rotation rate.

10. A method for vehicle or test stand mounted sensing of tire abnormalities or wheel

speed, comprising:

transmitting RF to a rotating tire or wheel rim;

receiving RF reflections from the rotating tire or wheel rim;

processing the received RF reflections to detect a tire abnormality or wheel speed.

11. The method of claim 10 wherein processing the received RF reflections comprises processing Doppler reflections.

12. The method of claim 11 wherein processing the received RF reflections comprises processing quadrature Doppler reflections.

13. The method of claim 10 wherein the transmitted RF is directed to and the received RF reflections are received from a tire tread.

14. The method of claim 10 wherein the transmitted RF is directed to and the received RF reflections are received from a tire sidewall.

15. The method of claim 10 wherein the transmitted RF is directed to and the received RF reflections are received from a structural member of a wheel that casts a radar reflection that differs from the rest of the wheel.

16. The method of claim 10 further comprising controlling a vehicle system in response to the detected tire abnormality or wheel speed.

17. A tire or wheel monitoring apparatus comprising:

a radar transceiver positioned in a fixed relationship to a rotating tire or wheel and for transmitting RF signals to the rotating tire or wheel for receiving reflected echoes from the rotating tire or wheel;

a processor connected to the radar transceiver for processing output signals from the radar transceiver to provide an indication of a tire parameter or wheel speed.

18. The apparatus of claim 17 wherein the radar transceiver is mounted on a vehicle.

19. The apparatus of claim 17 wherein the radar transceiver is mounted on a test stand.

20. A tire or wheel monitoring apparatus comprising:

a radar transceiver positioned in a fixed relationship to a rotating tire or wheel for transmitting RF signals to a selected portion of the rotating tire or wheel and for receiving reflected echoes from the selected portion of the rotating tire or wheel;

a processor connected to the radar transceiver for processing output signals from the radar transceiver to provide an indication of a tire parameter or wheel speed.

21. The apparatus of claim 20 wherein the radar transceiver is mounted on a vehicle.

22. The apparatus of claim 20 wherein the radar transceiver is mounted on a test stand.

23. A tire or wheel monitoring system for vehicles, comprising:

a radar transceiver mounted on the vehicle to transmit RF signals to a rotating tire or wheel and to receive reflected echoes from the rotating tire or wheel;

a processor connected to the radar transceiver for processing output signals from the radar transceiver to provide tire condition or wheel speed information;

a vehicle control system connected to the processor to control a vehicle system in response to the tire condition or wheel speed information.